

IN THE SPECIFICATION

Add the following paragraph (more specifically, the following section header) to page 1, immediately after the Title of the invention (i.e., at line 3).

C1 CROSS-REFERENCE TO RELATED APPLICATIONS

Replace the paragraph beginning on page 5, line 22 and ending on page 6, line 17 with the following paragraph: 

As can be expected, to completely fill the trench 4e with the Cu material 7, further plating is required. Fig. 2c illustrates the resulting structure after additional Cu plating. In this case, the Cu thickness t3 over the field region 8 is relatively large and there is a step s1 from the field regions 8 to the top of the Cu material 7 in the trench 4b trench 4e. Furthermore, if there is no leveler included in the electrolyte formulation, the region over the high aspect-ratio vias can have a thickness t4 that is larger than the thickness t3 near the large feature. This phenomena is called "overfill" and is believed to be due to enhanced deposition over the high aspect ratio features resulting from the high accelerator concentration in these regions. Apparently, accelerator species that are preferentially adsorbed in the small vias as explained before, stay partially adsorbed even after the features are filled. For IC applications, the Cu material 7 needs to be subjected to CMP or other material removal process so that the Cu material 7 as well as the barrier layer 5 in the field regions 8 are removed, thereby leaving the Cu material 7 only within the features as shown in 2d. The situation shown in Figure 2d is an ideal result. In reality these material removal processes are known to be quite costly and problematic. A non-planar surface with thick Cu such as the one depicted in Figure 2c has many drawbacks. First of all, removal of a thick Cu layer is time consuming and costly. Secondly, the non-uniform surface cannot be removed uniformly and results in dishing defects in large features as well known in the industry and as shown in Figure 2e.

Replace the paragraph on page 11, lines 5-6 with the following paragraph:

C3

Figure 2D Fig. 2d illustrates a cross sectional view of an ideal workpiece structure containing the conductor within the features.

C4

Replace the paragraphs on page 11, lines 7-8 with the following paragraph:

Figure 2E Fig. 2e illustrates a cross sectional view of a typical workpiece structure containing the conductor within the features.

C5

Replace the paragraphs on page 11, lines 14-15 with the following paragraph:

Figures 5A-5D Figs. 5a-5d2 illustrate various sweepers that can be used with the electrochemical mechanical deposition apparatus according to the present invention.

C6

Replace the paragraphs on page 11, lines 16-18 with the following paragraph:

Figures 6A-6E, 6DD and 6EE Figs. 6a-6e, 6dd and 6ee illustrate using various cross sectional views a method for obtaining desirable semiconductor structures according to the present invention.

C7

Replace the three paragraphs beginning on page 18, line 22 through page 19, line 2 with the following paragraph:

As shown in Figure 5C Fig. 5c, the sweeper may also be in the form of a small rotating sweeping belt 55 (rotating drive mechanism not shown, but being of conventional drive mechanisms) with a sweeping surface 54 resting against the wafer surface. Again, more than one such sweeper may be employed.

C8 Replace the three paragraphs beginning on page 19, lines 3-8 with the following paragraph:

Each of the sweepers illustrated in ~~Figures 5A-5C~~ Figs. 5a-5c can be adapted to be placed on the end of a handle 41 as described above, such that the motion of the sweeper relative to the workpiece surface can be programmably controlled. Further, for embodiments such as those illustrated in ~~Figure 5B and 5C~~ Fig. 5b and 5c where the sweeper itself is rotating about some axis, such as the center of the circular pad in ~~Fig. 5B~~ Fig. 5b and around the small rollers in ~~Fig. 5C~~ Fig. 5c, this rotation can also be separately and independently programmable controlled.

C9 119 Replace the three paragraphs beginning on page 18, lines 9- 21 with the following paragraph:

Another practical sweeper shape is a thin bar or wiper 58 shown in ~~Figures 5D1 and 5D2~~ Figs. 5d1 and 5d2 as being a straight bar 58A and a curved bar 58B, respectively. This bar 58 may be swept over the wafer surface in a given direction, such as the "x" direction shown in ~~Figure 5D1~~ Fig. 5d1, under programmable control, and, if cylindrical, may also rotate around an axis. The bar 58 could also be stationery when being used, and, if desired, be pivotable about a pivot point so that it could be removed from over the wafer surface when not in use, as shown in ~~Figure 5D2~~ Fig. 5d2 with bar 58B and pivot 59. For each of the sweepers described above, the surface area of the sweeper portion of the sweeper that will physically contact the top surface of the wafer has a size that is substantially less than the top surface of the wafer. Typically, the surface area of the sweeper portion that contacts the top surface of the wafer is less than 20% of the surface area of the wafer, and preferably less than 10% of the surface area of the wafer. For the bar or wiper type sweeper, this percentage is even less.

C10 Replace the paragraph on page 29, lines 12-20 with the following paragraph:

Also, this embodiment advantageously reduces the total time of physical contact between the mask 70 and the wafer and minimize possible defects such as scratches on the wafer. This embodiment may especially be useful for processing wafers with low-k dielectric layers. As well known in the industry, low-k dielectric materials are mechanically weak compared to the more traditional dielectric films ~~such as SiO₂ such as SiO₂~~. Once a sufficient additive differential no

C10
Contd

longer exists, the mask 70 can again move to contact the wafer surface and create the external influence, as described above. If the mask 70 repeatedly contacts the surface of the wafer, continued plating will yield the Cu film of Figure 6c.